

PATENT**REMARKS**

Claims 1-12 are currently pending in this application. Reconsideration is respectfully requested in light of the following remarks.

The Examiner rejected claims 1 and 7-12 under 35 U.S.C. §102(e) as being anticipated by U.S. Patent 6,813,514 to Kroll et al. Applicants respectfully traverse this rejection.

Applicants' claimed invention as recited in claims 1 and 11 is directed to a method and corresponding system for emulating a surface electrocardiogram (EKG) of a patient. For example independent claim 1 recites a method comprised in part by distinguishing portions of the cross-chamber cardiac signal corresponding to atrial signals from those corresponding to ventricular signals and adjusting the relative amplitudes of the portions of the cross-chamber cardiac signal corresponding to atrial signals and ventricular signals so as to yield an emulated surface EKG. (Underlining added for emphasis only). Applicants respectfully submit that Kroll et al. do not disclose or suggest the recited claim elements.

Rather, the system of Kroll et al. utilizes a calibration or set-up method for calibrating a surface EKG emulation technique. The calibration method is performed by an external programmer in combination with an implantable cardiac stimulation device implanted within a patient and a multiple-lead surface EKG unit. In Kroll et al. separate initial multiple-lead surface EKG signals are input to the external programmer from the EKG unit as detected using separate surface electrodes attached to the patient. Initial internal electrical cardiac signals sensed by the implanted device using internal electrodes are also input to the external programmer.

A set of conversion values for converting internal cardiac signals into separate multiple-lead surface EKG signals are then generated, based on a comparison of the initial surface EKG signals and the initial internal cardiac signals. Then, separate multiple-lead surface EKG signals are emulated based on newly sensed internal electrical cardiac signals using the conversion values. With this set-up technique, the emulation process is thereby calibrated for use with a particular patient based on surface EKG signals detected for that patient.

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The system of Kroll et al. may also take into account factors which affect the relative locations of leads implanted within the patient such as respiration, posture and the phase of the cardiac cycle. For example, in one embodiment the system of Kroll et al. utilizes different conversion matrices depending upon the factors affecting the relative locations of the internal electrodes. By taking into account such factors as respiration, phase of the cardiac cycle, and posture, a more accurate emulation of the surface EKG is achieved that compensates for movement of the internal electrodes relative to one another and relative to the lead locations of the surface EKG being emulated. (Kroll et al., col. 6, lines 1-20).

Thus, the system of Kroll et al. compensates for electrode movement that occurs during different parts of the cardiac cycle by applying a different conversion value to a particular cardiac signal depending upon whether the signal was measured during a P-wave, QRS cycle or T-wave. Kroll et al. do not however disclose or in anyway suggest distinguishing portions of the cross-chamber cardiac signals that correspond to atrial signals and ventricular signals and adjusting the relative amplitudes of the portions of the cross-chamber cardiac signal corresponding to atrial signals and ventricular signals so as to yield an emulated surface EKG as recited in applicant's claimed invention.

Accordingly, applicants respectfully submit that claims 1 and 11 are novel and unobvious over Kroll et al. and are therefore allowable. Applicants further submit that claims 7-10 and claim 12 that depend from claims 1 and 11 respectively are allowable as are claims 1 and 11 and for additional limitations recited therein.

The Examiner rejected claims 2-3 under 35 U.S.C. §103(a) as being unpatentable over Kroll et al. and claims 4-6 under 35 U.S.C. §103(a) as being unpatentable over Kroll et al. in view of U.S. Patent 6,501,983 to Nataragan. Applicants respectfully traverse this rejection.

Applicants respectfully submit that Kroll et al. was filed after November 29, 1999 and is assigned to a common assignee as the current application. Therefore, under 35 U.S.C §103(c), Kroll can not be used as a 35 U.S.C §102(e) reference to support a rejection of the pending claims under 35 U.S.C §103(a). Applicants therefore respectfully request that this rejection be withdrawn.

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The Examiner rejected claims 1-12 under the Judicially create doctrine of Double Patenting as being unpatentable over claims 1-16 of U.S. Patent 6,813,514 to Kroll et al. Applicants respectfully traverse this rejection.

As argued above, Kroll et al. do not disclose or suggest distinguishing portions of the cross-chamber cardiac signals and adjusting the relative amplitudes of the portions of the cross-chamber cardiac signal corresponding to atrial signals and ventricular signals so as to yield an emulated surface EKG as recited in applicants' claimed invention. Rather, Kroll et al. disclose and claim a method and corresponding system for generating emulated EKG signals that inputs separate initial multiple-lead surface EKG signals from an EKG unit which are detected using separate surface electrodes attached to the patient and initial internal electrical cardiac signals sensed by an implanted device using internal electrodes. The system of Kroll et al. as recited in claim 1 of Kroll et al. for example, then generates, based on a comparison of the initial surface EKG signals and the initial internal cardiac signals, a set of conversion values for converting additional internal cardiac signals into separate multiple-lead surface EKG signals.

Thus, Kroll et al. utilizes a calibration routine to generate conversion values from measured surface EKG signals and internal cardiac signals. Kroll et al. then utilize the conversion values to generate emulated surface EKG signals from internal cardiac signals. Kroll et al. further disclose compensating for electrode movement that occurs during different parts of the cardiac cycle by applying a different conversion value to a particular cardiac signal depending upon whether the signal was measured during a P-wave, QRS cycle or T-wave.

Kroll et al. do not however disclose or in anyway suggest distinguishing portions of the cross-chamber cardiac signals and adjusting the relative amplitudes of the portions of the cross-chamber cardiac signal corresponding to atrial signals and ventricular signals so as to yield an emulated surface EKG as recited in applicant's claimed invention. Accordingly, applicants respectfully submit that claims 1 and 11, and all claims dependent thereon, are unobvious over Kroll et al. and are therefore allowable. Applicants therefore respectfully request that this rejection be withdrawn.

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In light of the above remarks, it is respectfully submitted that the application is in condition for allowance, and an early notice of allowance is requested.

Respectfully submitted,

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Date

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